FORESTRY RESEARCH

WHAT'S NEW IN THE WEST

U.S. Department of Agriculture Forest Service

JULY 1977

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a note to you

Forestry Research: What's New in the West, is a report on the work of the USDA Forest Service's four Forest and Range Experiment Stations in the West. These research centers, and the States included in their areas of study are: Rocky Mountain (North Dakota, South Dakota, Nebraska, Kansas, Colorado, Arizona, New Mexico, and part of Wyoming, Oklahoma, and Texas); Intermountain (Montana, Idaho, Utah, Nevada, and part of Wyoming); Pacific Northwest (Alaska, Oregon, and Washington); and Pacific Southwest (California, Hawaii, and the Pacific Basin).

on the cover

Air to ground communication and a flagman are used to aid the flight crew in locating small field plots in conjunction with photo interpretation studies of range vegetation. See "Toward Better Resource Assessments" on facing page.

our addresses

Single copies of most of the publications mentioned in this issue are available free of charge. When writing to research Stations, please include your complete mailing address (with ZIP) and request publications by author, title, and number (if one is given).

For INT publications write:

Intermountain Forest and
Range Experiment Station
507 25th Street
Ogden, Utah 84401

For PSW publications write:

Pacific Southwest Forest and
Range Experiment Station
Post Office Box 245
Berkeley, California 94701

For PNW publications write:

Pacific Northwest Forest and
Range Experiment Station
Post Office Box 3141
Portland, Oregon 97208

For RM publications write:

Rocky Mountain Forest and
Range Experiment Station
240 West Prospect Street
Fort Collins, Colorado 80521

If you are planning to move, please notify us as much in advance as possible. Send your old address, your new address, and the address label from the back cover to *Forestry Research: What's New in the West,* 240 West Prospect Street, Fort Collins, Colorado 80521.

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Toward better resource assessments

Wendell O. Schroll, Forest Service pilot, and Dick Myhre, scientific photographer, with their Forest Service Aero Commander and mapping camera system.

Growing demands for natural resources and environmental preservation pose complex challenges to our Nation's future. Witness controversies over energy development, timber harvesting, pollution control and wilderness preservation to name a few.

The Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA) and the National Forest Management Act of 1976 (NFMA) direct the Forest Service to intensify planning for future management of National Forest lands, for forestry research, and for State and Private forestry assistance, to help meet these challenges. In fact the Forest Service is to submit plans, in the form of a recommended agency program, to the President and the Congress every five years.

This kind of planning requires lots of facts from many sources. So RPA directs the Forest Service to assemble the facts and assess the status of the Nation's renewable natural resources every 10 years. These assessments, also submitted to the President and Congress, are combined with public opinions and professional judgement to form the basis for Forest Service program proposals.

In June of 1976, the Resources Evaluation Techniques Research and Development Program was established at Rocky Mountain Forest and Range Experiment Station to take a lead role for improving and speeding ways of making national resource assessments.

Other agencies such as the Bureau of Land Management, Soil Conservation Service, Economic Research Service, Fish and Wildlife Service, Geological Survey and National Aeronautics and Space Administration were asked to participate. Several of these agencies are assigning their own representatives to the Program staff.

Research goals

The Program objective is to mold the best available resource inventory and analysis techniques into an efficient system for assessing multiple resources on public and private lands nationwide. With information from all lands, the Forest Service can do a better job of identifying those actions for lands and activities within its scope of responsibility that will make the most significant contribution to national welfare.

The Program staff will concentrate on ways to answer such questions as: Where are the resources? How much is there? What is their condition? How available are they? What are the demands for them? How will changing prices affect future demands? How will various land and resource uses interact to affect future supplies? What are the opportunities to improve productivity? How will human and environmental welfare be affected by various resource and land uses?

Oxygen mask is necessary at 25,000 feet as Dick Myhre readies camera equipment during photo mission.

Bob Dana, physicist, uses a microdensitometer to scan aerial photographs. Color characteristics from these photos define ground vegetation types. This data is then stored on a digital computer tape for later analysis.

Where sound techniques already exist for answering these questions, they'll be incorporated into the system. Where there are gaps, new techniques will be developed. Emphasis will be on broad, multiresource inventories rather than conventional single resource approaches.

Initial research is focusing on five problems that pose immediate barriers to a multiresource assessment process.

1. Techniques are needed for inventorying several resources simultaneously, rather than individually as in the past. Integrating timber and range inventories into a single process will be the first step in this direction. Test sites for developing the technique are located in South Carolina, Colorado, and Washington. These sites were selected to represent a variety of vegetation, terrain and land use patterns in different physiographic regions of the country. At each location, the major components of an inventory system will be worked out: (a) the resource and land parameters to measure; (b) the measurement methods; (c) the sampling design or designs; and (d) data processing procedures. Major emphasis will be on evaluating the utility of various sampling designs and remote sensing techniques for making integrated resources inventories.

A sizable knowledge base already exists for research in this area. For example, imagery from the Earth Resources Technology Satellite (LANDSAT) can be used to detect and measure major changes in land use patterns. Conversion of rangeland or forest land to agricultural crop production or urban development can already be determined from satellite imagery. Reasonable estimates of timber or range forage production have been made using a combination of satellite imagery and aerial photography in several areas. Program scientists are determining the extent to which these results may be applied to other sections of the United States. Multilevel sampling using ground measurements, and measurements from different aerial photograph scales, has been applied in certain locations to identify plant species and density, and areas covered by specific plant communities. The efficiency of these techniques is being evaluated, and modified for application in other parts of the country.

2. Inventory and assessment of outdoor recreation and wilderness opportunities, and wildlife and fish habitat pose special problems. For example, there are few available guidelines for defining the relevant parameters to be measured and evaluated for national assessments of outdoor recreation and wilderness, especially for dispersed recreation opportunities. Decisions to provide different outdoor recreation and wilderness experiences are often constrained politically, socially, or by other resource and land uses. The jobs here are to define the parameters that must be measured, and to develop techniques for evaluating those measurements in relation to other resource values.

Dick Francis, range scientist and Wally Greentree, forestry technician, interpret aerial photographs for compiling natural resource inventory data.

Wildlife and fish populations are mobile and the habitat requirements for some species cover extensive, highly diverse environments. The thrust of research in this area is to define those parameters essential to an effective national assessment of habitat, singly or together with other resource values like timber, range, and watershed.

3. Analytical techniques for projecting future regional and national timber supplies under various resource and market conditions are deficient. Several operational models are already available for projecting physical timber

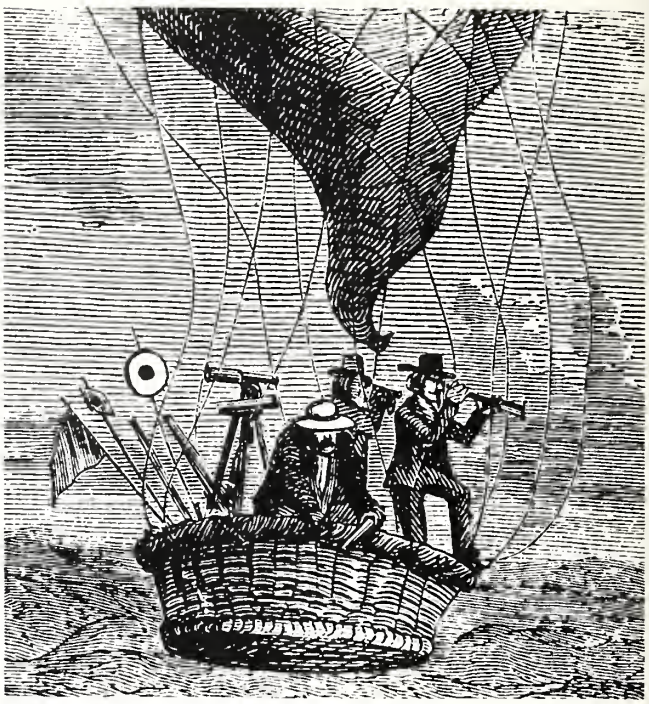
supplies but these need to be modified for regional and national assessment application.

A technique for estimating and projecting timber supplies based on economic constraints will be demonstrated on a study area in the South. The technique will take into account such variables as closeness to market, physical barriers in the woods, and condition of the timber. After a practical technique is developed, it will be further tested in other regions. Program scientists expect to use existing methods for predicting physical timber supplies as an integral part of projecting economic availability.

4. The national data base for tabulating and analyzing present and future standing timber inventories, and supplies of wood products after milling residue losses, needs a great deal of improvement. Emphasis is on bringing the data base up to standard for the 1980 RPA Timber Assessment. Regional timber statistics gathered by Resources Evaluation Units at other Experiment Stations are being integrated into this national data base.

5. Efficient and effective mechanisms are needed for storing, retrieving, displaying and updating data bases required for national assessments of forest and rangeland renewable resources. Most current data bases have been constructed for functional use; timber data bases for timber, and range data bases for range, being examples. The goal here is a data base that will contain basic resource information that can be withdrawn and displayed to make multiresource decisions. Existing systems will be used as fully as possible.

Norm Merritt, computer programmer, intensifies satellite imagery on a Spatial Data System color image enhancer.

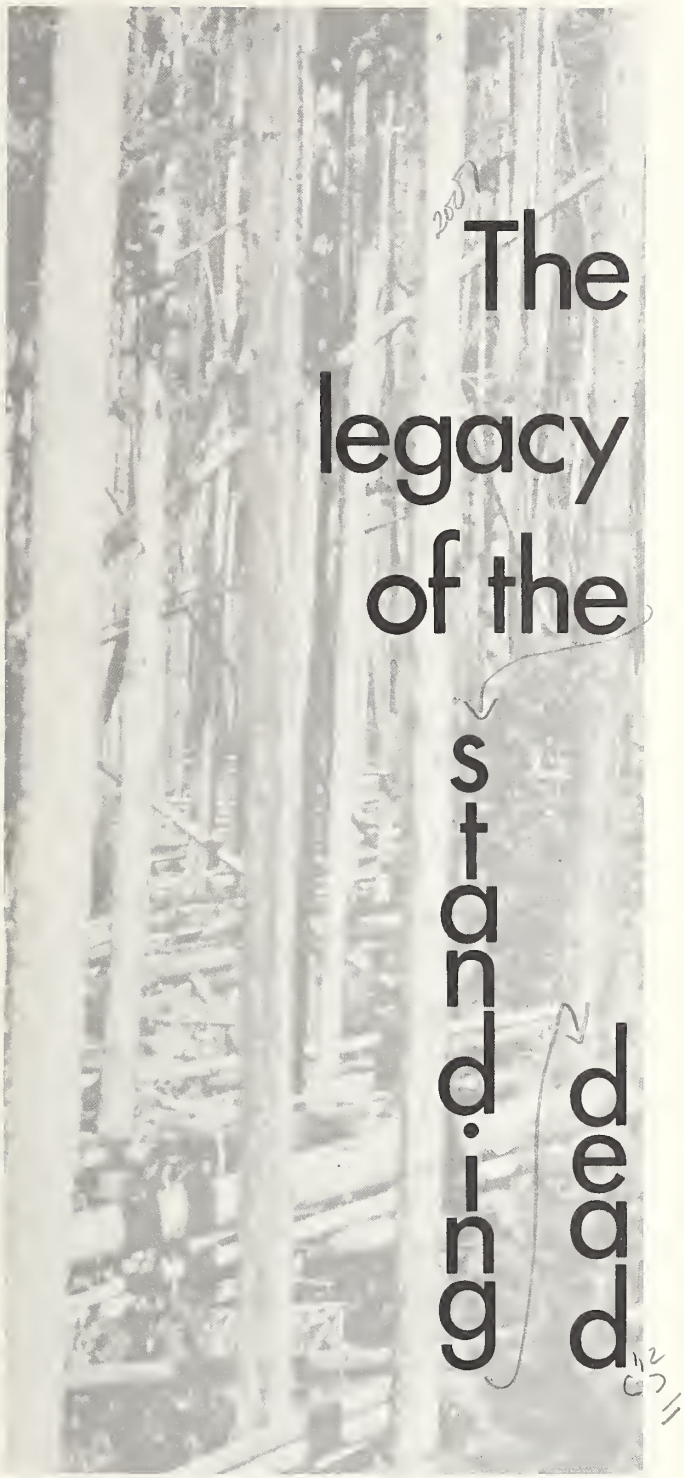


Resource assessment methods of today are far ahead of those used in earlier times.

Results from the Resources Evaluation Techniques Research and Development Program should greatly improve multiresource inventory and analysis procedures for use at regional and national levels. Plans call for partial implementation in the 1980 National Assessment, and full implementation by 1990. The ultimate payoff will be more up-to-date, accurate facts for developing regional and national programs under the provisions of RPA and NFMA.

If you desire more information or have questions concerning this program, contact Program Manager Richard S. Driscoll at the Rocky Mountain Station, Ft. Collins, Colorado — (303) 482-7332, (FTS 323-1264).

—By Richard S. Driscoll and Phil Johnson, Rocky Mountain Station



The legacy of the standing dead

This lodgepole pine stand contains a large number of standing dead trees in a range of deterioration classes.

Stands of dead trees that stretch for miles in some parts of the West, silvering with each passing year, are figuratively filled with gold. Many of the ghostly trunks contain wood that is still sound and can be profitably sawn into lumber.

"With a few exceptions, it has been assumed in the past that standing dead timber had no value for lumber and was suited only for chips," says Dick Woodfin, leader of research on Timber Quality Yields and Grades at the Pacific Northwest Station in Portland, Oregon. "Everyone recognized deterioration, but no one really knew how rates of deterioration and the length of time since death affect what a sawmill can recover in products."

Now results from two studies give proof that much valuable lumber can be produced from trees that have been dead for several years. These findings may provide the economic incentive to remove more standing dead timber in the future.

The two studies were begun at the Pacific Northwest Station in 1974. In one study, research forester Tom Fahey worked in eastern Oregon with grand fir that had died in 1972 and 1973 following defoliation by the Douglas-fir tussock moth. He found less than 5 percent difference between the volume recovered from trees dead for 2 years and comparable live trees. The volume of lumber recovered from live trees was 32.2 percent of the total tree volume from stump to a 6-inch diameter top; from the dead trees it was 27.5 percent. But because of deterioration, more lumber from the dead trees was classified in lower grades. The loss of grade was more severe in small diameter logs than large ones and was caused mainly by drying checks. Losses from sap rots and ambrosia beetles were minor.

Even with the volume losses, the value of the dead trees was $43 per 100 cubic feet, compared with $59 per 100 cubic feet for live trees. Expressed in dollars per thousand board feet of lumber, the average value was $139 for green trees and $125 for dead ones.

Study trees (133 live and 50 dead) were logged and sawn into lumber by the same methods used commercially every day. Fahey worked directly with local timber and mill owners. The logging and sawmill crews received no special training for the studies.

An additional study

At the same time the study on true fir was being done, another study was producing strikingly similar results. Forest Products Technologist Tom Snellgrove worked with standing dead western white pine on the Clearwater National Forest in Idaho. This study was more complex as it covered a greater range of time since mortality. Some study trees had been dead less than 2 years and some more than 7 years.

Snellgrove found that trees dead for up to 2 years had a value equal to 72 percent of the value of live trees of comparable diameter and quality. Trees dead for 3 to 6 years were worth 44 percent as much as live trees. The oldest dead (7 years and more) were worth 29 percent as much as live trees. Drying and subsequent checking, combined with blue stain, were the major causes of lower lumber grade in trees dead 1 to 2 years. Checking caused less degrade in the larger trees.

In both studies, the loss in volume and value of dead trees showed up at three stages of the logging and milling process: 1) fewer logs were taken from the forest, due to breakage in felling and handling; 2) because of defects, a smaller amount of lumber was cut from logs at the mill; and 3) more of the cut lumber was classified in lower grades because of defects.

There are several reasons for the gradual loss of lumber volume and grade in dead trees. When a tree dies, microorganisms, molds, fungi, and insects begin the long process of reducing the tree to its organic components, which then become nutrients available to other plants. During this process, the dead tree's needles turn brown and fall. The bark loosens and slips away. As the tree loses moisture, the outside dries faster than the interior, and checks or cracks develop in the bole to relieve the stress. Decay fungi, introduced by insects, cause stains on the wood which reduce its value as finishing lumber — although it may occasionally increase its value for some specialty products. A tree that has no branches or crown to cushion its fall is more likely to break when felled. Because of breakage, the costs of logging and processing are higher per unit of product.

This 10-inch diameter white pine had been dead 3-6 years, and had no needles, twigs, or small branches. Even with the deterioration indicated by the deep checks, it contains a significant amount of usable wood.

Volume estimates

Since several months or a year may elapse before it is obvious that a tree is dead, there are no precise counts of the number of standing dead in the West. But there are estimates based on forest surveys. Estimates in "Outlook for Timber in the United States" indicate that in 1970, there were more than 11 billion cubic feet of salvageable softwood sawtimber killed by fire, insects, and other destructive agents on commercial forest land in the western United States. The amount of softwood timber cut in the entire United States in 1970 was less than 9 billion cubic feet.

Estimates prepared in 1975 for a Forest Service study team showed the following volumes, in billions of board feet, of accessible,

salvageable, dead, softwood timber on National Forest land in the West: lodgepole pine 2.48, Douglas-fir 1.07, ponderosa pine .36, western white pine .45, and true firs and spruces 1.20.

Excessive standing dead timber can present obstacles to good forest management — as a fire hazard or a barrier to replanting. Some dead trees are needed in every forest stand to provide habitat for birds and other animals important in forest ecosystems. Much dead timber, however, is a resource that is going to waste and is gradually losing value.

To help foster utilization of standing dead timber, the Pacific Northwest Station's Timber Quality research unit began product yield studies in 1974. Before that time there had been almost no work done that followed standing dead timber through the sawmill to finished lumber.

The results of Fahey's and Snellgrove's studies were summarized in a paper Woodfin presented at the Rocky Mountain Forest Industries Conference in Missoula, Montana, in April 1976. Reprints of this paper, "Potentials from Salvage Timber," are available from the Pacific Northwest Station.

Information on all studies is available either in publications or by telephone from the Timber Quality Unit. (Call 503/234-3361, Ext. 4966, or FTS 429-4966.)

The area covered by this research unit is the geographical range of all western softwood species. The unit's research produces information of interest to industry in all states west of the Rocky Mountains. A large portion of the softwood timber from federal lands of the West is valued for sale on the basis of information of the type developed by this project. Close cooperators are the Intermountain and Rocky Mountain Stations, and the western regions of the Forest Service. Extensive cooperation is received from the companies and associations of the forest products industry. To assure uniform standards, the lumber products are graded under the supervision of a Western Wood Products Association Quality Supervisor.

Sample trees are selected to represent a range of diameters, stages of deterioration and timber quality. After surface characteristics are recorded, the sample tree is tagged with a number that is used to identify all products it yields at the sawmill.

Looking to the future

During the next 3 years, Woodfin and his staff will concentrate on studies of product recovery from standing dead timber. Studies involving lodgepole pine and ponderosa pine are currently underway. There will be additional work on grand fir and western white pine. Studies are planned also on Engelmann spruce, western larch, ponderosa pine, and Sitka spruce and western hemlock in Alaska.

Meanwhile, other research at the Pacific Northwest Station and elsewhere is directed toward understanding and preventing

Lumber of several dimensions and grades, cut from study trees at a cooperating sawmill, is sorted for drying.

problems related to dead timber. Since the primary cause of timber mortality is catastrophic outbreaks of insects such as the Douglas-fir tussock moth, the mountain pine beetle, the western pine beetle, and the spruce budworm, emphasis is on entomological studies.

Still other studies are trying to find out how much dead material is needed in the forest to provide nutrients for the next generation of trees, and provide perching and nesting sites for wildlife.

But for the millions of dead trees that are not needed in the forests for nutrients or wildlife, Woodfin says: "We will be able to say more accurately which dead trees may pay their way through the sawmill. So far, the product recovery has been better than anyone thought it would be."

—By Dorothy Bergstrom, Pacific Northwest Station

Meeting a forest's nutrient needs

Forest trees have specific and complex nutrient needs. All trees require not only 13 nutrients from the soil, but they need them in fairly specific amounts at various stages of growth.

At the Pacific Southwest Forest and Range Experiment Station, research forester Robert F. Powers is working on a series of interrelated studies to determine nutrient requirements of commercially important pines and true firs in the West.

He hopes to present methods and guidelines that land managers can use to determine: nutrient deficiencies on specific forest sites; how and when to apply fertilizer to remedy these deficiencies; and how management practices, such as prescribed burning, harvesting, and slash piling, affect soil nutrients.

Powers is attempting to improve — and sometimes combine — several of the techniques used to determine when nutrients are below "critical levels" and to relate these techniques more specifically to forest lands.

Powers believes, for example, that soil bioassay doesn't simulate forest field conditions accurately enough. In conventional bioassays, fast-growing plants, such as lettuce and barley, are grown in soil samples treated with various fertilizers. The soils and plants are analyzed to determine possible deficiencies and to pinpoint fertilizer treatments that will give the best results.

Intact soil cores from an old-growth red fir forest are seeded with fir in the greenhouse. Seedling yields are compared with yields from cores taken under other forest conditions to help evaluate effects of silvicultural treatments on soil fertility.

One of the problems with this technique — in addition to the use of fast-growing plants instead of conifers — is the fact that the soil samples are carefully screened, sifted, and processed. Powers says that this alters important soil properties, such as bulk density, aeration and drainage, and nutrient distribution patterns.

For his test plants, he uses trees of the same species and the same genetic makeup as trees in the stands being analyzed. He also

Research Forester Robert Powers has grown mixed conifer species in solution cultures as a preliminary step in determining their nutritional requirements.

uses "plugs" — intact, soil-profile cores taken from depths near the current rooting zone (about 30 cm deep). This technique "brings some of the natural variability of the field plot into the greenhouse." His preliminary results show that his core samples are more accurate indicators of field response to fertilizers than are the conventional sieved samples.

Counteracting problems

Powers also cites problems with conventional soil chemical analyses. One is that nutrients shown in the analysis may be in crystalline or organic forms that trees can't absorb. Another problem is that standard methods usually were developed for agricultural crops and have not been evaluated properly for wildland trees. To counteract this, he has compared chemical extractants, such as sodium bicarbonate, in simulating how trees absorb phosphorus, a mineral that is often deficient in forest soils. So far, sodium bicarbonate has proved the best of several extractants. He has shown, for example, that the critical level for phosphorus is 25 parts per million for young seedlings of ponderosa pine and white fir.

He recommends combining bioassay and chemical analysis with foliar analysis of tree needs. His experiments have shown that critical levels of nitrogen and phosphorus in ponderosa pine, Douglas-fir, and white fir range between 0.9 and 1.1 percent of the dry weight of recently matured needles for nitrogen, depending on species, and 0.15 percent for phosphorus.

Powers used the combination of foliar analysis and soil chemical analysis to relate the nitrogen-supplying power of soil to site index. Using foliage and soil samples collected from stands of ponderosa pine in northern California, he measured the amount of soil nitrogen available to trees, and correlated it to site index and to nitrogen levels in the needles. His results showed that site index for ponderosa pine increased linearly with available soil nitrogen, up to about 20 parts per million. Above that level, site index did not improve significantly.

Comparing foliage nutrients

Powers has found that foliage analysis is a quick and reliable way to determine if nutrient conditions of brushland sites are suitable for planting conifers. At more than 80 locations in California and southern Oregon, he is comparing the foliage nutrients in conifers to those in manzanita, a shrub that grows in association with ponderosa pine and other tree species. As far as he knows, the study is the first of its kind in the Western U.S. He has established a correlation between the levels of nitrogen, phosphorus, magnesium, and iron in manzanita foliage and the nutrient levels needed for ponderosa pine. He concludes that site index for ponderosa pine can be predicted from nitrogen levels in manzanita foliage.

Soils in forest nurseries present special problems because they are continually tilled, planted, fertilized, and irrigated. Nutrients are lost, either through uptake by seedlings or through leaching. Through combinations of foliar and soil analysis, Powers hopes to develop fertilizer prescriptions for nursery beds that will counteract the expected nutrient losses.

Powers is also working on nutrient problems in red fir stands at high elevations. On one site he found that red fir and greenleaf manzanita seedlings, growing in an area of scalped topsoil, had low foliar nitrogen content, while snowbrush, a nitrogen-fixing species, had relatively high levels. To see whether a fertilization schedule can counteract the problems of immature soils and the slow rate at which nutrients are taken up, he is monitoring the effect of applications of nitrogen — alone or in combination with other nutrients.

At high elevations, the low temperatures slow down the rate at which litter and other organic matter on the forest floor decompose, which results in needed nutrients being bound up in the litter. So, at another red fir site, he is trying various combinations of thinning and fertilization with nitrogen, to see whether the decomposition rate can be increased to release nutrients for tree use. The University of California, Berkeley, is cooperating in this study.

In a study of mineral cycling and fertilization in a mixed-conifer plantation, soil temperatures are monitored through probes.

Powers is also trying to learn more about the long-range effect of various forest management practices. At a site on the Swain Mountain Experimental Forest in the Cascades where slash had been burned in an extremely hot fire, he found trees with foliar concentrations of nitrogen about 20 percent less than concentrations in trees on nearby unburned or lightly burned areas. Soil bioassays showed serious nitrogen and phosphorus deficiencies, and available nitrogen was almost 40 percent less than that on undisturbed stands. Powers says these results suggest that it may take more than a decade to rebuild nitrogen concentrations after a hot slash fire.

Fertilization plan

Powers' ideas for improving nutrient analysis techniques have been incorporated in a cooperative forest fertilization plan now being tried by the Pacific Southwest Station and the National Forests of California. The program was started in 1975 and will continue through 1985, with the objective of producing mathematical models foresters can use to predict forest response to nitrogen fertilizer. The study will eventually encompass 50 sites that are representative of commercial, sapling-to-sawtimber stands in California. Stands will be weeded, thinned, and treated with 0, 224 and 448 kilograms of nitrogen per hectare. For 5 years following fertilizer treatments, changes in the chemistry of soil and foliage will be monitored, and tree and stand growth will be measured.

Powers has based his forest nutrition studies on two principles. "The first," he says, "is that soil fertility is one of our fundamental resources, and is the primary factor controlling forest productivity that we can influence directly. To maintain soil fertility, we need to evaluate it scientifically to see how it changes under differing forest practices."

In discussing his second principle, he says: "Fertilization remains one of the few ways we have of improving site quality. If fertilization is to become a beneficial, reliable, and economic technique in forestry, we need to know — before we apply fertilizer — exactly what biological, ecological, and economic returns we can expect."

Forestry Research readers who need further information on the studies described here are welcome to write: Robert F. Powers, Pacific Southwest Station, 1615 Continental Street, Redding, CA 96001, or to phone him at (916) 246-5455 (on FTS phone: 461-8455).

—By Marcia Wood, Pacific Southwest Station

To chart the movement of nitrogen through the soil profile of a red fir forest, soil solutions are extracted and taken to the laboratory for chemical analysis.

References are recorded on magnetic tape to be fed into the computer.

FIREBASE: transferring fire information

Suppose you are a fire management officer in an area where the accumulation and treatment of forest residues is a complex problem. You know that solving the problem requires sound decisions based on the latest and best fuels management knowledge available. You know that fuel management problems are being studied, and that the information you need probably is available in reports and published articles. Unfortunately, you don't have time to make the comprehensive literature search required to locate them. And if you did find the necessary research documents, they might be so filled with methodology and scientific jargon that you could not clearly understand the author's results in the reading time you have. You need a quick, dependable source of fuels information that is useful, to the point, and easily understood.

If this scenario sounds like a situation you have faced, take heart. The type of information you need is now available — from FIREBASE.

FIREBASE supplies, upon request, bibliographic citations and informative digests of published and unpublished items pertinent to every facet of forest and range fires.

What is FIREBASE

FIREBASE, the fire information segment of the computer assisted Renewable Resources Technical Information System (RRTIS), was developed by the Intermountain Station's Fire in Multiple-Use Management Research, Development, and Application Program located at the Northern Forest Fire Laboratory, Missoula, Montana. Alan Taylor, research forester, spearheaded the effort to provide technical information from wildland fire literature quickly and in the most usable form, to anyone in the international fire community.

FIREBASE can respond to your information request by supplying bibliographic citations and digests.

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###  169 ####
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<AUTHOR     >
<CORP AU    >U.S. Department of Agriculture, Forest Service, Pacific
Northwest Region, Division of Fire Management.
<DATE       >17 Jan 1975
<TITLE      >Timber Shaded Fuel Breaks in Region Six.
< PUB DESC>R-6 Fuel Management Notes.  6 p.  2 ref.  1 tab.  U.S.
Department of Agriculture, Forest Service, Pacific Northwest Region,
Division of Fire Management, Portland, OR, USA.
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<TOPIC      >Fuel Management; Fire Management
<KEYSUG     >Fire Presuppression; Fuel Breaks; Economics
<GEO        >North America, USA, Great Basin and Pacific Slope States,
Pacific Northwest (USA), Washington; Oregon
<ABSTRACT >
<P          >Almost 300 miles of shaded fuel-breaks have been constructed
in the Pacific Northwest Region of the U.S. Forest Service.  Unlike
stands which are thinned to remove brush, heavy ground fuels, snags,
and dead trees.  Ladder fuels are removed from the remaining trees in
the stand.  Frequently, both the quality and quantity of timber
produced in a stand increases after construction of a shaded
fuel-break.
<S          >The average cost of constructing a mile of shaded fuel-break
in the Pacific Northwest Region of the U.S. Forest Service was about
$4,000 in 1974.  A table shows:  the location of shaded fuel-breaks
constructed on each of the national forests in the Pacific Northwest,
the miles of fuel-break constructed, the miles under construction,
average width, cost per mile, location on the slope, and the method of
funding.
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FIREBASE digests usually have two parts; the <P>, or "Principal Message" section, and the <S>, or "Specifics" section. For items dealing with scientific studies, a typical <P> section is a plain language, results-oriented paragraph that states the problem, the research and the results. A typical <S> section provides details on methodology, parameters measured, mathematical equations, and other specifics. It does not, however, contain numerical data or tabular information collected in the research process. Some digests do describe the kinds, sources, and amounts of data contained in the original documents.

A small but important part of FIREBASE is fire-related training information. Seventeen types of training items, including training schedules, motion pictures, and video tapes are described in specialized digests. This material should help in the design and implementation of training programs.

If copyright and other regulations permit, original documents selected for FIREBASE are recorded on microfilm (microfiche). Microfiche copies are available to users who, after reading a FIREBASE digest, feel they need additional information.

Current status

FIREBASE is a small-but-growing database, with about 3,500 items on file. If you are a land manager, scientist, administrator, educator, or anyone else having a fire information need, anywhere in the world, you may find that FIREBASE is useful — today. Five major access centers across the United States are awaiting your telephone call or written request.

Alan Taylor screens documents for FIREBASE.

If it is necessary to charge for microfiche or photocopies, you will be notified of the costs before they are incurred. At present, there is no charge for other FIREBASE services. Ultimately, FIREBASE and other databases of RRTIS will be operated on a cost recovery basis, with individuals or their organizations paying nominal fees.

To put FIREBASE into action: 1) think carefully about the kind of fire information you need; 2) call or write the nearest FIREBASE Access Center; and 3) express your need as specifically as possible. The Access Center operator will search the computer file and send the resulting printout of citations and digests to you, usually within 3 days.

The Access Centers are:

FIREBASE Access Center
Science Information Services
PSW Forest & Range Experiment Station
P.O. Box 245
Berkeley, CA 94701
Telephone: (415) 486-3688
FTS: 449-3688

FIREBASE Access Center
USDA Forest Service, S&PF
1720 Peachtree Road, NW
Atlanta, GA 30309
Telephone: (404) 881-3734
FTS: 257-3734

FIREBASE Operations Center
Boise Interagency Fire Center
3905 Vista Avenue
Boise, ID 83705
Telephone: (208) 384-9458
FTS: 554-9458

FIREBASE Access Center
U.S. Dept. of the Interior
Natural Resources Library
Research Services Branch
Washington, D.C. 20240
Telephone: (202) 343-3896
FTS: 343-3896

FIREBASE Access Center
USDA Forest Service
Forest Fire & Atmospheric
Sciences Research
P.O. Box 2417
Washington, D.C. 20013
Telephone: (703) 235-8195
FTS: 235-8195

Like other Forest Service computerized systems with potential national and international application, FIREBASE will be tested and evaluated for the next two years. During this period, FIREBASE is under the administration of the Deputy Chief for State and Private Forestry, Forest Service USDA, and is headquartered at the FIREBASE Operations Center, Boise Interagency Fire Center, Boise, Idaho. Douglas H. Baker, S&PF coordinator at the Center, has been assigned program management responsibilities. Questions and comments about FIREBASE should be directed to him.

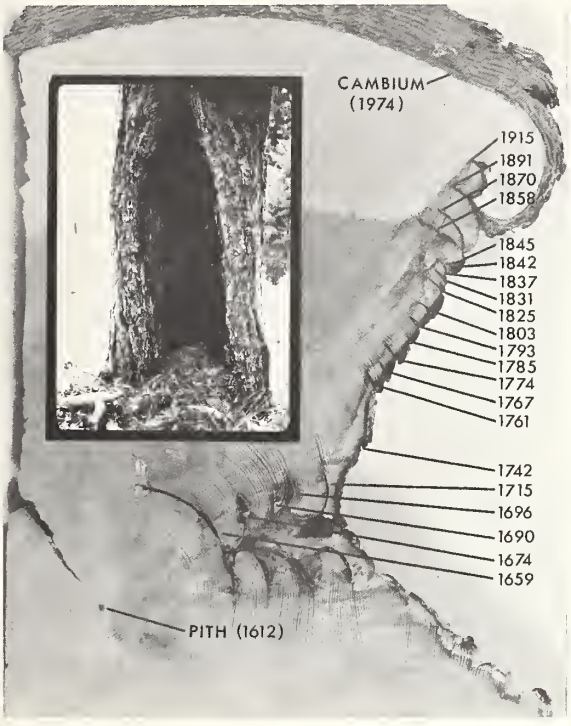
Major cooperators in the development of FIREBASE are fire-related divisions of the Forest Service, the Forest Service Technical Information Office, the Bureau of Land Management, and Oak Ridge National Laboratories of the Energy Research and Development Administration. International cooperation with the Agricultural Research Information System (AGRIS-Forestry) under development by FAO of the United Nations, is coordinated by the Forest Service Technical Information Office.

You can help

To serve you better, the FIREBASE file must grow. You can play an important role in the expansion. If you have fire-related information that you feel should be shared with the fire community, you are urged to send it to Ms. Karen L. Eckels, Assistant Manager of the FIREBASE program, FIREBASE Operations Center, Boise, Idaho 83705. If the items are already in the system, they will be returned immediately. Digesting and microfiching new materials may take as long as 5 months.

—By Alan R. Taylor, Intermountain Station; and Karen L. Eckels, FIREBASE Operations Center.

Publications



Seeking answers from the past

Researchers at the Intermountain Station are obtaining historical fire information from objects that have been recording data for over 300 years — fire-scarred trees.

Ecologist Stephen F. Arno of the Station's Forest Ecosystems research work unit, Missoula, developed a study to determine historical frequency, intensity, and influence of fire on stand structure and composition in various forest types of the Bitterroot National Forest in west-central Montana. He and other researchers dated nearly 900 individual fire scars on living trees, and analyzed age classes of shade-intolerant trees attributable to fire.

Results of the study show that fire was historically a major force in stand development in all forest types, but its significance has decreased markedly during the past 50 years, possibly because of organized fire suppression.

Arno's findings are detailed in "The Historical Role of Fire on The Bitterroot National Forest," INT-RP-187-FR-11, available from the Intermountain Station.

Applying the multiple use principle

The multiple use doctrine is part of the guiding philosophy of the Forest Service, but its effective implementation is a difficult task. A recently published paper titled "Alternatives Analysis for Multiple Use Management: A Case Study," by Thomac C. Brown, Economist with the Rocky Mountain Station, presents an application of the multiple use principle using economic analysis to evaluate management alternatives on a mixed conifer watershed. Physical yields of sawtimber, pulpwood, water, and forage, and effects on wildlife habitat and esthetics are estimated for six alternatives reflecting a variety of management emphases. Where possible, yields and costs of the alternatives are valued in dollars. The analysis is presented in a form that facilitates explicit identification of tradeoffs, in dollars where possible, and provides an easy way of isolating, and in most cases quantifying, the most relevant tradeoffs.

Copies of Research Paper RM-176-FR-11 are available upon request from the Rocky Mountain Station.

Regeneration and cutting methods

One of the forester's most difficult jobs is to match regeneration cutting methods to a given landscape and to specific silvicultural objectives.

Two publications by Philip M. McDonald, research forester at the Pacific Southwest Station, suggest that each cutting method has unique merits and that, through planning, the forest manager can capitalize on these merits.

In the first paper, McDonald evaluates the regeneration of five species of conifers, three of hardwoods, and two shrubs after use of five different cutting methods –clearcutting, seed tree, shelterwood, group selection, and single-tree selection. His evaluation was made in terms of seedling stocking, density, and height growth.

In the second paper, McDonald describes an evaluation of a two-stage shelterwood cut to determine changes in species composition and stand structure, seedfall, regeneration, and growth of the residual stand.

The results showed increased amounts of seed and seedlings, plus accelerated growth in residual stands. They indicated that shelterwood cutting should be attractive to a wide range of landowners, including those having small acreage and limited capital.

Copies of both papers are available from the Pacific Southwest Station. Request: "Forest Regeneration and Seedling Growth from Five Major Cutting Methods in North Central California," PSW-115-FR-11; and "Shelterwood Cutting in a Young-Growth Mixed-Conifer Stand in North Central California," PSW-117-FR-11.

The cubics are coming

The Forest Service plans to be ready to sell stumpage by the cubic foot rather than the board foot by 1980. This means that people who buy and process timber will have to be ready to use the new measure to describe logs and product potential. A recent publication from the Pacific Northwest Station points out that information currently or potentially available on product yields and log volume can be used in making the transition from board feet to cubic measurements.

The authors show how to calculate both lumber and veneer recovery from log volume and figure the product recovery ratio in cubic measure. They also point out

that conversion from cubic measure to metric is a simple mathematical process.

Researchers have already concluded that cubic measure is the only satisfactory way to express product recovery from standing dead timber (see "The Legacy of the Standing Dead" in this issue). Because of scaling defect in dead timber, dollars per thousand board feet, net Scribner scale — the traditional expression of timber value — may be meaningless. The value is best described in such terms as dollars per 100 cubic feet of tree or log volume.

Reprints of the article "The Cubics are Coming: Predicting Product Recovery from Cubic Volume," by Thomas D. Fahey and Richard O. Woodfin, Jr., Journal of Forestry, November 1976, are available from the Pacific Northwest Station.

Should cubic be metric?

Should we leap from the board foot directly to the cubic metre for forestry measurements, bypassing the cubic foot? Dave Bruce, project leader for mensuration at the Pacific Northwest Station, thinks it is worth consideration. Bruce is chairman of the Metrication Committee of the Society of American Foresters, one of the many committees now at work to plan orderly conversion to metric measurement in the United States.

In an article appearing in the November 1976 issue of the Society's journal, Bruce invited discussion on the selection of metric units for use in forestry when the voluntary conversion is made. He suggests that U.S. foresters agree now on what metric units are suitable, convenient, and necessary for use in forestry. In doing this, he says, they might consider adopting the proposals already worked out in Canada and scheduled for use in that country in 1979. The Canadian proposals call for measuring trees and logs by the cubic metre, in place of the board foot, as now defined by six different log rules. Bruce suggests that in the United States, where more than six board foot log rules are in use, the logical move would be from the board foot directly to the cubic metre.

Reprints of "Metrication: What's Next?" by David Bruce, Journal of Forestry, November 1976, are available from the Pacific Northwest Station.

Provenance studies results

Results of provenance studies in eastern Nebraska in growth, survival and other traits of three conifer species have been published.

"Douglas-fir in Eastern Nebraska: A Provenance Study" (Research Paper RM-178–FR-11) describes an 11-year field test of rangewide provenances of Douglas-fir in that area. It reveals that height and growth rates are inversely correlated with latitude of origin. Progeny of seed origins from Arizona and New Mexico grew two to three times faster than those from northern Colorado, western Montana, and northern Idaho. Arizona and New Mexico origins are recommended for Christmas trees. Slower growing but winter-hardy northern Colorado origins are recommended for other types of planting.

The second study is detailed in "Eastern White Pine in Eastern Nebraska: A Provenance Study of Southern Appalachian Origins" (Research Paper RM-179-FR-11). It states that eastern white pines from 36 origins in the southern Appalachians have grown rapidly during 7 years in an eastern Nebraska plantation. Neither survival nor height growth were correlated with latitude of origin. Southern origins in general had the longest needles, while northern origins flowered first. Most origins are recommended for ornamentals and Christmas trees only in eastern Nebraska; none are recommended for windbreaks.

Results of the third study are published in "Austrian (European Black) Pine in Eastern Nebraska: A Provenance Study" (Research Paper RM-180-FR-11). This study found that heights, growth rates, flowering, cone production, needle dimensions, and resistance to Dothistroma needle blight differed significantly among 25 rangewide origins in a 12-year test. The fastest growing origin, also of highest resistance to Dothistroma needle blight, was from Yugoslavia; this origin is recommended for eastern Nebraska, and is now being widely planted in a state action program.

Ralph A. Read, research forester and John A. Sprackling, forestry technician, Rocky Mountain Station, coauthored the first two reports, and Read the third.

Copies of these papers, along with previously reported provenance studies of Scots pine, Research Paper RM-78; jack pine, Research Paper RM-143; and red pine, Research paper RM-144 for the Eastern Plains can be obtained by writing the Rocky Mountain Station.

Planning for range resource management

About 58 million acres of rangeland under Forest Service management are suitable for grazing. It is estimated that improved planning for direct management and range rehabilitation could produce an increase of more than 80 percent in Animal Unit Months per year.

Range RAM (Resource Allocation Method) is a computerized planning

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method for lands used mainly for grazing by either livestock or big game. As a planning tool, it will help managers on decisions and calculations on cost of range maintenance, improvement and utilization, harvested forage, animal months of grazing, rental fee income, and net revenue.

Three computer programs form the basic components of Range RAM to provide the planner help with: analysis of a wide spectrum of management activities; formulation of alternative combinations of activities; and formulation of problem solutions that are optimum in an economic sense and feasible in terms of social, political, and environmental criteria.

The program is described, and processes for its use are outlined in Research Paper PSW-120-FR-11, "RANGE RAM . . . a long-term planning method for managing grazing lands," by Henricus C. Jansen.

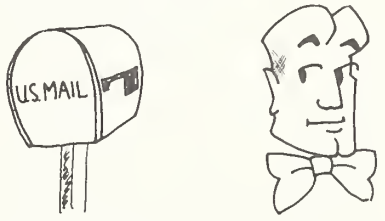
The brief Research Paper serves as an introduction only. Detailed instructions are available in a three-part Range RAM User's Manual, which is available on request from the Pacific Southwest Station.

Aspen symposium proceedings

A symposium on utilization and marketing of Rocky Mountain aspen was held September 8 and 9, 1976 in Fort Collins, Colorado. The gathering was organized to explore aspen product potentials as they relate to more intensive management of this species in the West.

The 33 papers presented at the meeting cover 5 areas: perspectives on Rocky Mountain aspen resource; aspen ecology and harvesting responses; market opportunities and limitations; research advances in aspen utilization; and applying research information to aspen management decisions.

You may obtain a copy of the proceedings, "Utilization and Marketing as Tools for Aspen Management in the Rocky Mountains," by writing the Rocky Mountain Station. Request General Technical Report RM-29-FR-11.



Keep a close watch for our next issue. Feature articles will include information on: forest habitat types of Montana; avalanche and blowing snow research; habitat requirements of woodpeckers; and more.

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